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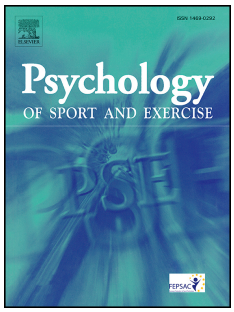

A home advantage? Examining 100 years of team success in National Hockey League playoff overtime games

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Abstract (Brief Report)

Objectives: To examine a potential home (dis)advantage in various types of playoff overtime games in the National Hockey League (NHL).

Design: Archival.

Method: Success rates for home and away teams in win-imminent overtime games (i.e., wherein a team has an opportunity to win the playoff series) were compared to their respective success in non-imminent overtime games (i.e., the outcome of the game does not determine the outcome of the series).

Results: When away teams had an opportunity to win a series, they were significantly more likely to win an overtime game compared to home teams. No such advantage was evident for home teams when they had an opportunity to win a series.

Conclusions: When an NHL team has an opportunity to win a playoff series, there appears to be an advantage for visiting teams—not home teams—in winning an overtime game.

Keywords: championship; choke; clutch; home advantage; pressure; self-attention

A home advantage? Examining 100 years of team success in National Hockey League playoff overtime games

Over the past few decades, the 'home advantage' phenomenon has been examined within dozens of studies (e.g., Carron, Loughead, & Bray, 2005; Courneya & Carron, 1992; Jamieson, 2010; Jones, 2014; Nevill & Holder, 1999). Early research suggested that there was a benefit to competing at one's home venue in light of "the consistent finding that home teams in sport competitions win over 50% of games played under a balanced home and away schedule" (Courneya & Carron, 1992, p. 14). Indeed, a meta-analysis by Jamieson (2010) found that teams who competed at home won 60% of athletic contests, which was significantly larger than what would be expected from chance. This home advantage was generally evident across a range of sports (e.g., soccer, basketball, ice hockey), competitive levels (e.g., collegiate and professional teams), and various types of games (e.g., regular-season and championship).

The differences between home and away team success are hypothesized to emerge due to game location factors—including advantages with regard to travel, rules, learning, and crowd noise—leading to changes in psychological, physiological, and behavioural states among athletes, coaches, and officials (Allen & Jones, 2014; Carron et al., 2005; Courneya & Carron, 1992). Various experimental studies have provided support for these hypotheses. For example, Unkelbach and Memmert (2010) found that soccer referees who watched scenes from matches in which a foul had been committed were more likely to hand out yellow cards if the crowd noise (which was manipulated by the researchers) was high compared to those who watched the same scene but under conditions of low crowd noise. In addition, Staufenbiel, Lobinger, and Strauss (2015) found that soccer coaches set more challenging team goals, had higher expectations that their teams would win, and were more likely to choose offensively-aggressive playing tactics if their team was playing at home compared to away team coaches. Additional studies have also

shown that hormones such as testosterone and cortisol levels are also higher when athletes perform at home rather than at an away venue (e.g., Carré, Muir, Belanger, & Putnam, 2006), which could reflect an inherent protective response within human species to territorial intrusions/threats (cf. Neave & Wolfson, 2003).

In contrast to the advantage that is typically evident amongst home teams, it has been hypothesized that there may be certain situations in sport whereby this advantage disappears and even reverses (Baumeister & Steinhilber, 1984). Specifically, in the first test of a potential home *disadvantage*, Baumeister and Steinhilber (1984) proposed that home crowds may present a source of pressure for home teams and, thereby, undermine performance when there is an imminent opportunity to win a competition—a phenomenon that they labelled as the "home choke". The authors found that in the World Series of Major League Baseball (MLB) from 1924 – 1982, home teams were more likely to win the first four games but less likely to win the final three games of the best-of-seven series, including 16 of the 26 games (61.5%) over that timespan that required a seventh game to decide the series. To explain these findings, the authors suggested that the "imminent opportunity to claim a desired [winner's] identity in front of a supportive audience might engender a state of self-attention that could interfere with the execution of skillful responses" (Baumeister & Steinhilber, 1984, p. 85). Complimentary research focused on choking under pressure has helped shed further light on the potential mechanisms that might explain how performance pressure (such as that induced by supportive crowds) can negatively impact athletes. Specifically, high-pressure situations can undermine performance by disrupting the automaticity that typically governs the execution of well-learned skills, and increasing individuals' self-consciousness, anxiety, and attention to distracting stimuli (Allen & Jones, 2014; Beilock & Gray, 2007). Supportive crowds in particular have been found to result in individuals executing their skills in an overly cautious manner (Butler & Baumeister, 1998).

Since the seminal research by Baumeister and Steinhilber (1984), various lab-based (e.g., Butler & Baumeister, 1998; Law, Masters, Bray, Eves, & Bardswell, 2003) and archival studies (e.g., McEwan, Martin Ginis, & Bray, 2012; Wright, Voyer, Wright, & Roney, 1995) have provided support for the notion of a home disadvantage—and corresponding away advantage—during various "outcome-imminent" situations (e.g., a last-second shot, the final/decisive game of a league's championship series). As opposed to comparing overall differences in the success rates of competitions between home and away teams (which arguably provides an incomplete and perhaps too simplistic account of this phenomenon), examining performance in certain types of games or in various situations within that game can help provide a more specific test of the home (dis)advantage. For example, Hoffman, Loughead, Dixon, and Crozier (2017) examined differences in win percentages between home and away teams across NHL games that ended in regulation, overtime, and shootouts. They found that the odds of winning were significantly higher for away teams compared to home teams when the game concluded in a shootout rather than in overtime. As another example, McEwan et al. (2012) analyzed differences in shot percentages between home and away teams across various situations within NHL shootouts. They found that there were no significant differences between home and away shooters in overall shot percentages or in shot percentages where teams faced some sort of outcome-imminent situation—that is, where the result of a shot could potentially determine the outcome of the game. However, in 'win-imminent' situations, there was a home *disadvantage* such that away shooters were more likely than home shooters to score in situations where they could win the game for their respective team if the player scored a goal on his current shootout attempt.

In addition to assessing differences in success rates between home and away teams in NHL regular season overtimes and shootouts (and the various situations within those shootouts), the NHL's playoff format may also be particularly useful in examining the home (dis)advantage. The

league's playoff format is unique compared to other professional sport in two particular ways. First, it is one of the three major professional sports—along with Major League Baseball (MLB) and the National Basketball Association (NBA)—where the competition between teams during league playoffs is decided by multiple games in a 'best-of' format (with most series in these leagues now following a best-of-seven-games format). In contrast, other sports leagues (e.g., National Football League) only have one game during their championship playoff rounds to decide a winner. The format of NHL playoff hockey differs further from the MLB and NBA, in that NHL overtimes follow a 'sudden death' format for both teams during playoffs. Specifically, when a playoff game is tied after regulation time (60 minutes over three periods), the game goes to overtime and the first team to score a goal wins the game. In contrast, teams play a five-minute overtime in NBA games; in MLB, if the away team scores a run in extra-innings (i.e., at the 'top' of the inning), the home team is still given an opportunity to tie or win the game (i.e., at the 'bottom' of the inning). Hence, with the NHL's playoff format, researchers can compare home and away teams' success of various types of outcome-imminent games. In addition, the sudden-death format of tie games further amplifies the imminence of these games. That is, while teams in other professional sports leagues still have an opportunity to tie and win a game if the opposing team scores, NHL teams are not afforded the same opportunity—rather, scoring a goal results in an immediate win, while allowing a goal results in an immediate loss.

The purpose of the current study was to examine win-loss records for home and away teams during NHL playoff overtime games. Informed by previous research on the home (dis)advantage, four specific hypotheses were tested. First, guided in part by the findings noted above by McEwan et al. (2012) regarding success rates in outcome-imminent situations, it was hypothesized that there would be no home or away advantage in outcome-imminent games overall. That is, when at least one of the teams had an opportunity to win the series by scoring a

goal in overtime, no significant differences in win percentages between home and away teams were expected (hypothesis 1). However, it was hypothesized that away teams would win significantly more overtime games than home teams in games where those away teams had an imminent opportunity to win a series (hypothesis 2). No such advantage was anticipated for home teams in these types of overtime games. That is, no significant differences in win-loss records were expected between home and away teams in overtime games wherein the home team had an opportunity to win a series (hypothesis 3). The final game of a series presents a unique situation in the sense that *both* teams have an imminent opportunity to win a series. In light of the findings from previous studies on win percentages in the final games of a playoff series (e.g., Baumeister & Steinhilber, 1984; Wright et al., 1995), it was hypothesized that away teams would win significantly more overtime games than home teams in this type of outcome-imminent situation (hypothesis 4). It does not appear that an examination of home and away teams' success in these various types of playoff games has previously been conducted. As such, the results of this study could provide a detailed test of Baumeister and Steinhilber's (1984) hypothesized home disadvantage, and a novel contribution to the home (dis)advantage in sport literature.

Methods

Data were obtained from the NHL's official website (nhl.com), which provides the results of all Stanley Cup playoff games in the league's history (1917 – 2018). All playoff series followed a 'best-of' format, wherein teams play each other in multiple games. There was a lockout during the 2004-05 season which resulted in the cancellation of the playoffs for that year. As a result, data from the current study represent 100 years of overtime playoff games. Currently (since the 1987 playoffs), 16 teams qualify for the playoffs each season and all series are decided in a best-of-seven format (i.e., 15 total series). Hence, teams have an imminent opportunity to win a series if they have a 3-0, 3-1, or 3-2 lead in games four, five, or six (respectively) of that series.

If the series is tied 3-3, both teams face a win-imminent opportunity in the decisive, "winner-take-all" seventh game of the series. Series winners continue to advance through to the fourth and final round of the playoffs, where the winning team are crowned the Stanley Cup champions. This best-of-seven format was also followed for all playoff series from 1943 to 1974. Between 1975 and 1987, the first round of the playoffs was decided through a best-of-five series (with the remaining rounds retaining the best-of-seven format). Prior to 1943, the playoffs went through several iterations (as teams were added to the league or dissolved) and included various combinations of best-of-three, best-of-five, and best-of-seven series formats.

Data Analysis

In the home (dis)advantage literature, differences in win-loss records between home and away teams are often compared using chi-square (χ^2) for contingency tables (e.g., Baumeister & Steinhilber, 1984; Jones, 2014). This data analytic approach was retained in the current study by constructing four separate 2 x 2 (winner x game type) contingency tables within SPSS software (Version 24; IBM SPSS Predictive Analytics, Chicago, IL). Thus, each overtime game was coded by noting the location of the winning team (home or away) and game type. For the purposes of this study, an *outcome-imminent* type of game was defined as a game where one or both of the teams have an opportunity to clinch the series. In the current best-of-seven playoff format, this occurs when one or both of the teams has obtained three of the necessary four wins in a seven-game series (i.e., when the series is 3-0, 3-1, 3-2, or 3-3). Outcome-imminent games were further broken down into three types of games: (1) *win-imminent-away*, where the away team could clinch the series if they score in overtime; (2) *win-imminent-home*, where the home team could clinch the series if they score in overtime; or (3) *final game*, where the home or away teams could clinch the series if either scores in overtime (e.g., the seventh game of a best-of-seven series, fifth game of a best-of-five series, or third game of a best-of-three series). All other overtime games,

wherein the result of the game could not immediately determine the series' winner, were labelled as *non-imminent* games (i.e., when the series was 0-0, 1-0, 1-1, 2-0, 2-1, or 2-2 in the best-of-seven format, 0-0, 1-0, 1-1 in the best-of-five format, or 0-0 in the best-of-three format). To test the study hypotheses, the number of home and away team wins were compared for each of the four types of outcome-imminent games. In each 2 x 2 table, the number of home and away team wins in non-imminent were used as the baseline comparison (cf. Baumeister & Steinhilber, 1984; Jones, 2014). Hence, the results of the chi-square tests reveal the differences between home and away team win percentages in an outcome-imminent overtime playoff games relative to their percentages in non-outcome-imminent overtime playoff games.

Results

Home and away teams' win percentages for each game type are provided in Table 1. The win percentages of home and away teams in 591 non-imminent games (used as a baseline comparison for each hypothesis) were 53.3% and 46.7%, respectively. In support of hypothesis 1, there were no significant differences in winning percentages between home (46.5%) and away (53.5%) teams in the 256 outcome-imminent overtime playoff games overall (χ^2 (*df*) = 3.32 (1), *p* = .068), relative to their winning percentages in non-imminent games; although it should be noted that this *p*-value approaches conventional levels of statistical significance ($p < .05$) in favour of an away team advantage. In support of hypothesis 2, away teams won significantly more games (58.5%) than home teams (41.5%) in the 123 overtime games wherein the away teams had an imminent opportunity to win the series (χ^2 (*df*) = 5.71 (1), *p* = .017), relative to the teams' win percentages in non-imminent games. No such advantage was found for home teams in the 82 games whereby they had an imminent opportunity to win the series. Specifically, in support of hypothesis 3, the win percentages for home (52.4%) and away (47.6%) teams in these types of overtime games did not differ significantly (χ^2 (*df*) = 0.02 (1), *p* = .888), relative to the win

percentages that were noted in non-imminent games. Contrary to the expectation corresponding to hypothesis 4, there were no significant differences in win percentages between home (49%) and away (51%) teams in the 51 final games of a series that went to overtime, wherein both teams had an imminent opportunity to win the series (χ^2 (*df*) = 0.35 (1), *p* = .329), relative to win percentages in non-imminent games.[1]

Discussion

The purpose of this archival study was to examine a potential home (dis)advantage in various types of NHL playoff overtime games over the league's 100-year history (1917 – 2018). Previous studies (e.g., Baumeister & Steinhilber, 1984; Jones, 2014; Wright et al., 1995) have examined team success rates in certain games of a series, such as by comparing home and away team win percentages in the early games of a seven-game series (e.g., games 1-4) as well as in the later games of a series (e.g., games 5-7). However, these analyses did not examine team performance in specific types of games (e.g., in win-imminent games for the home team, away team, or both teams) nor did they consider the imminence that is presented in overtime games specifically—rather, those studies compared win percentages in playoff games regardless of whether the game went to overtime or not. Other studies (e.g., Hoffman et al., 2017) have compared home and away team success in overtime games; however, those analyses focused on regular-season games, rather than playoff games. As such, the current study provides a potentially notable addition to the home (dis)advantage literature as well as a novel means of testing Baumeister and Steinhilber's (1984) "home choke" hypothesis. Three of the four hypotheses tested in this study were supported. The results corresponding to each of these hypotheses, along

[1] It should be noted that the win percentages were very similar when the final game of three-, five-, and seven-game series were examined. In other words, the presented results do not vary when the final games in these three series lengths are examined together or separately.

with the implications and potential future research associated with each result are provided below.

It was first hypothesized that there would be no overall differences between home and away teams' winning percentages in overtime games when at least one of the teams had an opportunity to win a playoff series (with the teams' win percentages in non-imminent overtime games serving as the baseline comparison). This hypothesis was supported, which aligns with the results from previous studies that have found null effects in home and away team success in outcome-imminent situations (such as in shootouts in NHL regular season games; McEwan et al., 2012). It should be noted, however, that the difference ($p = .068$) approached conventional levels of statistical significance (i.e., $p < .05$) in favour of the away team winning significantly more outcome-imminent games than home teams (53.5% versus 46.5%, respectively). Hence, it could be *tentatively* concluded that there is no home (dis)advantage overall in overtime playoff games when one or both of the teams has an opportunity to win a series. That said, future research on the differences in home and away team success in playoff overtime games should be conducted with other sports leagues to determine whether this null effect is apparent in those sports as well, or if those differences reach conventional levels of statistical significance.

Second, it was predicted that away teams would win significantly more overtime games than home teams when the away team had an imminent opportunity to win a series. This hypothesis was indeed supported with away teams winning 58.5% of these games. Conversely, no such advantage was anticipated for home teams in overtime games wherein the home team had an opportunity to win a series. This hypothesis was also supported with home teams winning 52.4% of these games, which was quite similar to their winning percentage in non-outcome imminent games (53.3%). These results appear to align with, and extend, findings from previous studies, such as those from Wright et al. (1995) who found an away advantage in the game that

concluded a NHL playoff series (whether game 4, 5, 6, or 7). The current results add to those findings by breaking these games into either a win-imminent opportunity for the home team or a win-imminent opportunity for the away team. Moreover, demonstrating that there is an away advantage (i.e., home disadvantage) in overtime games specifically is important, as these games arguably provide a more specific test of Baumeister and Steinhilber's (1984) hypothesis, due to the imminence embedded within sudden-death overtimes. Thus, while many studies have examined performance in various types of championship and non-championship games (e.g., Baumeister & Steinhilber, 1984; Jamieson, 2010; Jones, 2014; Wright et al., 1995), additional studies examining performance in various types of games when overtime is required could provide a further (and perhaps more detailed) test of the home (dis)advantage and supplement the results from previous studies.

Finally, it was hypothesized that away teams would win significantly more overtime games than home teams in the final, decisive game of a series wherein *both* teams have an opportunity to win the series—that is, in game 7 of a seven-game series (or, in earlier seasons of the NHL's history, game 5 of a five-game series or game 3 of a three-game series). This hypothesis was not supported, as there were no significant differences between home and away teams in these games.[1] This is an interesting (null) finding when compared to previous studies that have examined the home (dis)advantage in game sevens. For example, as previously mentioned, Baumeister and Steinhilber (1984) found that away teams won 16 of the 26 (62%) MLB World Series games that required a seventh game to decide the series between 1924 and 1982. By contrast, in an updated analysis of these games, Jones (2014) found that home teams won all eight World Series game sevens from 1983-2012. Further, Jones (2014) found that home teams won 15 out of 17 game sevens (88%) in National Basketball Association (NBA) championship and semi-

finals series from 1983-2012. Yet, neither a home nor away advantage was found in the current study.

There may be two potential reasons in particular for these contrasting results. For one, it should be reiterated that the results from both Baumeister and Steinhilber (1984) as well as Jones (2014) were based on home and away team win percentages in game sevens regardless of whether or not that game required overtime. As such, the "*imminent* opportunity to claim a desired [winner's] identity" (Baumeister & Steinhilber, 1984, p. 85, emphasis added) may not be as prominent in those other leagues compared to the NHL. Second, these results may be due to the differences in the playoff formats of NHL games compared to NBA and MLB games. Specifically, overtime games in NHL playoffs are decided in a 'sudden death' format, wherein the team that scores the first goal in overtime wins the game. As such, there is an additional amount of imminence in NHL overtime games compared to NBA overtime games (which consist of 5 minutes of overtime) and MLB games that require extra innings (whereby the home team still has an opportunity to tie or win the game in the 'bottom' of the inning even if the away team scores a run in the 'top' of the inning). Hence, a unique situation is presented when the decisive game of a playoff series goes to sudden-death overtime (such as in NHL games), as *both* teams have an imminent opportunity to win the series by being the first team to score a goal (as opposed to the other types of outcome-imminent games where just one team has an opportunity to win the series). Based on the (null) results from the current study, it would appear that neither a home advantage nor disadvantage exists in these types of overtime games. Further research on the home (dis)advantage in other sports that follow a 'best-of' playoff format along with a 'sudden-death' overtime format appears warranted to examine the generalizability of these findings.

Although the results of this study provide a novel and potentially substantive contribution to the home (dis)advantage literature, it is not without certain limitations. For one, the hypothesis

by Baumeister and Steinhilber (1984) proposes that a home disadvantage is due to supportive audiences enhancing home athletes' perceived pressure and inducing self-attention, which could interfere with the execution of skillful responses. While this explanation is certainly possible, one would be unable to conclusively determine that this was the mechanism of the results in the current study, since no mediation analyses were able to be conducted (due to the archival nature of the study). In addition, although the aforementioned sudden-death overtime format of NHL playoff games enhances the imminence of these games and the 'best-of' playoff format allows for comparisons of team success based on the various types of games, it does potentially limit the generalizability of these findings due to the somewhat unique format of NHL playoff overtime games compared to other sports. Moreover, the 2 x 2 contingency tables were specifically chosen in order to test the hypotheses of this study, in a manner that was similar to past examinations of the home (dis)advantage (e.g., Baumeister & Steinhilber, 1984; Jones, 2014). Of course, it is important to recognize that this type of analysis precludes one from considering other factors that might be involved in team success, such as distance travelled by away teams (cf. Carron et al., 2005; Courneya & Carron, 1992) or team quality (cf. Hoffman et al., 2017).

Conclusion

The results of the current study provide further nuance to our understanding of the home (dis)advantage in sport. Overall, the findings appear to support the notion that away teams might have an advantage over home teams when there is an imminent opportunity to claim a winner's identity. Future research examining the home (dis)advantage in specific types of games (and situations within those games) in other sports as well as the mechanisms that might explain the differences in success between home and away teams will help advance the literature on this area of study beyond its current state.

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Table 1

Home and away team success rates in National Hockey League playoff overtime games (1917-2018).

Game Type	**Home Team Wins**	**Away Team Wins**
All OT games (n = 847)	434 (51.2%)	413 (48.8%)
Non-Imminent (n = 591)	315 (53.3%)	276 (46.7%)
Outcome-Imminent (n = 256)	119 (46.5%)	137 (53.5%)
WI-Away Team (n = 123)	51 (41.5%)	72 (58.5%)
WI-Home Team (n = 82)	43 (52.4%)	39 (47.6%)
Final Game (n = 51)	25 (49%)	26 (51%)

Note. OT: overtime; WI-Away Team: visiting team can win the playoff series with a win in current game; WI-Home Team: home team can win the playoff series with a win in current game. Results do not include data from the 2004-05 season, as the playoffs were cancelled due to a league lockout.

Highlights

- Examination of team success in professional hockey (NHL) playoff overtime games
- There was an away team advantage when they had a chance to win a playoff series
- No home team advantage was found when they had a chance to win a series
- Home and away teams were equally likely to win final games that went to overtime